



FEMA

**HMGP RECONSTRUCTION GRANT
PILOT FOR HURRICANES KATRINA,
RITA AND WILMA**

**UNIT COST GUIDANCE AND
INSTRUCTIONS FOR DEVELOPING
UNIT COST ESTIMATES**

January 8, 2007

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SECTION 1. INTRODUCTION

1.1. PURPOSE

The purpose of this document is to provide unit cost estimate guidance and instructions on the development of unit cost estimates for projects submitted under FEMA's HMGP Reconstruction Grant Pilot activities for Hurricanes Katrina, Rita and Wilma in the following States: Louisiana (DR-1603 and DR-1607), Texas (DR-1606), Mississippi (DR-1604), Alabama (DR-1605) and Florida (DR-1602 and DR-1609). The unit cost estimate guidance, instructions and tables provided in this document have been specifically prepared to support the HMGP Reconstruction Grant Pilot, and should only be used in conjunction with FEMA's HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006. The unit cost approach described in this document must be followed for all HMGP Reconstruction Grant Pilot applications, regardless of whether a community prepares cost estimates using FEMA unit cost estimate data or prepares cost estimates using their own supporting documentation.

1.2. BACKGROUND

Section 2.5 of FEMA's HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006 states: "Each HMGP Reconstruction Grant Pilot project requires a cost estimate as part of the technical and cost effectiveness evaluation process." Specific requirements for unit cost estimates are based on Section 2.5 of the guidance and listed in the paragraphs that follow.

Based on the foundation type and required elevation height, a square foot cost for each potential combination of structure characteristics will be developed. All structures of the same type within an application will have costs allocated at the same square foot rate. Applicants will identify the type and number of structures of each possible combination to be included in the proposed project.

For cost estimating purposes, the breakdown of structure types will be based on the following structure and foundation characteristics:

- Structure Type:
 - One story
 - Two story
- Structure Area:
 - 800 to 3,200 square feet (one story)
 - 1,200 to 3,600 square feet (two story)
- Foundation Type:
 - Open foundation
 - Closed foundation
- Foundation Height:
 - 0 to 5 feet
 - 5 to 10 feet
 - 10 to 15 feet
 - Over 15 feet

To facilitate the application development process FEMA will provide square foot cost estimates for each combination of the above structure characteristics by geographic region to the Grantee. The square foot costs will be developed with the understanding that the costs of eligible construction activities can vary based on the quality and type of construction materials and finishing work. Reconstruction costs will be based on materials, service equipment and construction practices of "standard grade," with basic exterior ornamentation and interior refinements consistent with an average quality of construction as defined by Marshall & Swift, R.S. Means, and based on a construction consistent with Section 2.3.8 [of the guidance]. Any costs incurred above and beyond the square foot costs as allocated by FEMA will not be the responsibility of FEMA and will not be included in the determination of the Federal share or local match for Pilot activities. As with all HMGP activities, only actual costs incurred for eligible activities will be reimbursed by the Grantee.

The square footage of the reconstructed structure shall not be more than 10 percent greater than the square footage of the original structure. Funding is restricted to a maximum of \$150,000 Federal share per structure for HMGP Reconstruction Grant Pilot projects. However, some eligible activities such as administrative allowances and permitting fees need not be included in the \$150,000 maximum Federal share as detailed in Table 2-1 located in Section 2.1 of the HMGP Reconstruction Grant Pilot Guidance.

1.3. FEMA UNIT COST ESTIMATE APPROACH

In accordance with Section 2.5 of the HMGP Reconstruction Grant Pilot Guidance, FEMA has prepared unit cost estimates for one-story and two-story structures with open and closed foundations for foundation heights of 0 to 5 feet, 5 to 10 feet and 10 to 15 feet. The square foot cost estimate data tables prepared by FEMA are provided in Section 3.0 of this document, and are based on R.S. Means *Square Foot Costs* (2006) for an average quality of construction as defined by the guidance. It is anticipated that FEMA will update these unit costs data tables every three months based on quarterly cost adjustments and local multipliers provided by R.S. Means.

SECTION 2. INSTRUCTIONS FOR DEVELOPING UNIT COST ESTIMATES

This section provides step-by-step instructions for developing unit cost estimates for projects submitted under FEMA's HMGP Reconstruction Grant Pilot. These steps are presented below, and details are included in the sections that follow.

Steps for Developing Project Unit Cost Estimates

- **Preliminary Steps (Project Scoping)**
 - **Step 1:** Select general foundation type
 - **Step 2:** Select specific foundation
- **Intermediate Steps (Determining FEMA Unit Cost Estimates)**
 - **Step 3:** Determine structure square footages
 - **Step 4:** Select appropriate FEMA unit cost guidance
 - **Step 5:** Establish FEMA base unit cost estimates
 - **Step 6:** Determine FEMA unit cost estimates
 - **Step 7:** Evaluate FEMA unit cost estimates
- **Final Steps (Optional: Preparing Applicant Unit Cost Estimates)**
 - **Step 8:** Prepare applicant cost estimates
 - **Step 9:** Determine applicant unit cost estimates
 - **Step 10:** Evaluate applicant unit cost estimates

2.1. PRELIMINARY STEPS

The preliminary steps in developing project unit cost estimates involve following the project scoping process found in the HMGP Reconstruction Grant Pilot Guidance to determine the foundation type, foundation height and number of stories for the structure or structures to be included in the proposed project. Details regarding these preliminary steps are outlined below.

STEP 1: SELECT GENERAL FOUNDATION TYPE

The first step in the development of project unit cost estimates is to select the general foundation type based on location of property in the floodplain. Follow Step 1 of the project scoping process in the HMGP Reconstruction Grant Pilot Guidance to determine the foundation type for the structure or structures associated with the proposed project. A flow chart that outlines Step 1 of the project scoping process is provided in Figure 2-1. For additional details, refer to the Appendix attached to this document. The attached Appendix is taken from portions Appendix B of the HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006 (Sections B.1 to B.4 on pages 42-50).

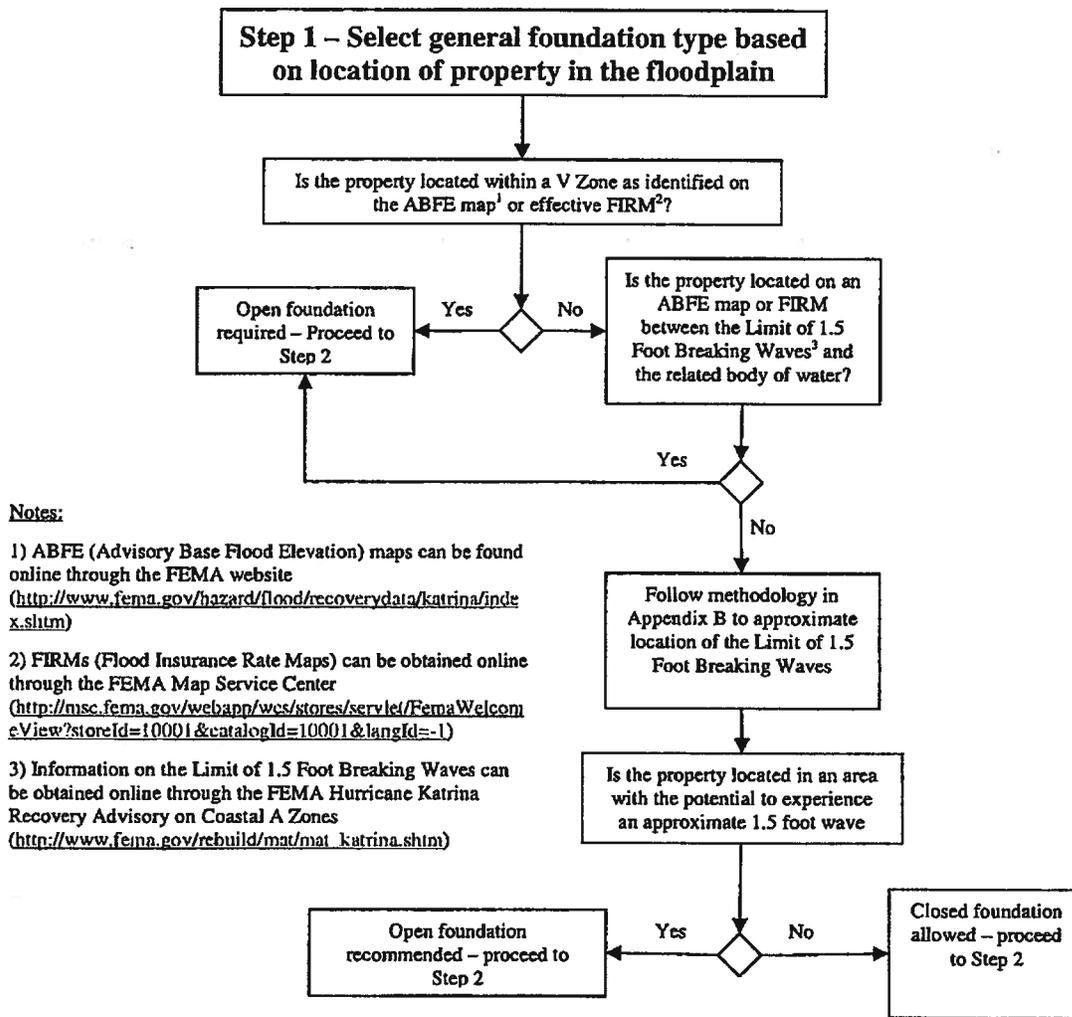


Figure 2-1. Flow Chart Showing Step 1 of the HMGP Reconstruction Project Scoping Process (Source: HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006)

STEP 2: SELECT SPECIFIC FOUNDATION

The second step in the development of project unit cost estimates is to select the specific foundation type based on additional site factors. Follow Step 2 of the project scoping process in the HMGP Reconstruction Grant Pilot Guidance to determine the foundation type and foundation height for the structure or structures associated with the proposed project. A flow chart that outlines Step 2 of the project scoping process is provided in Figure 2-2.

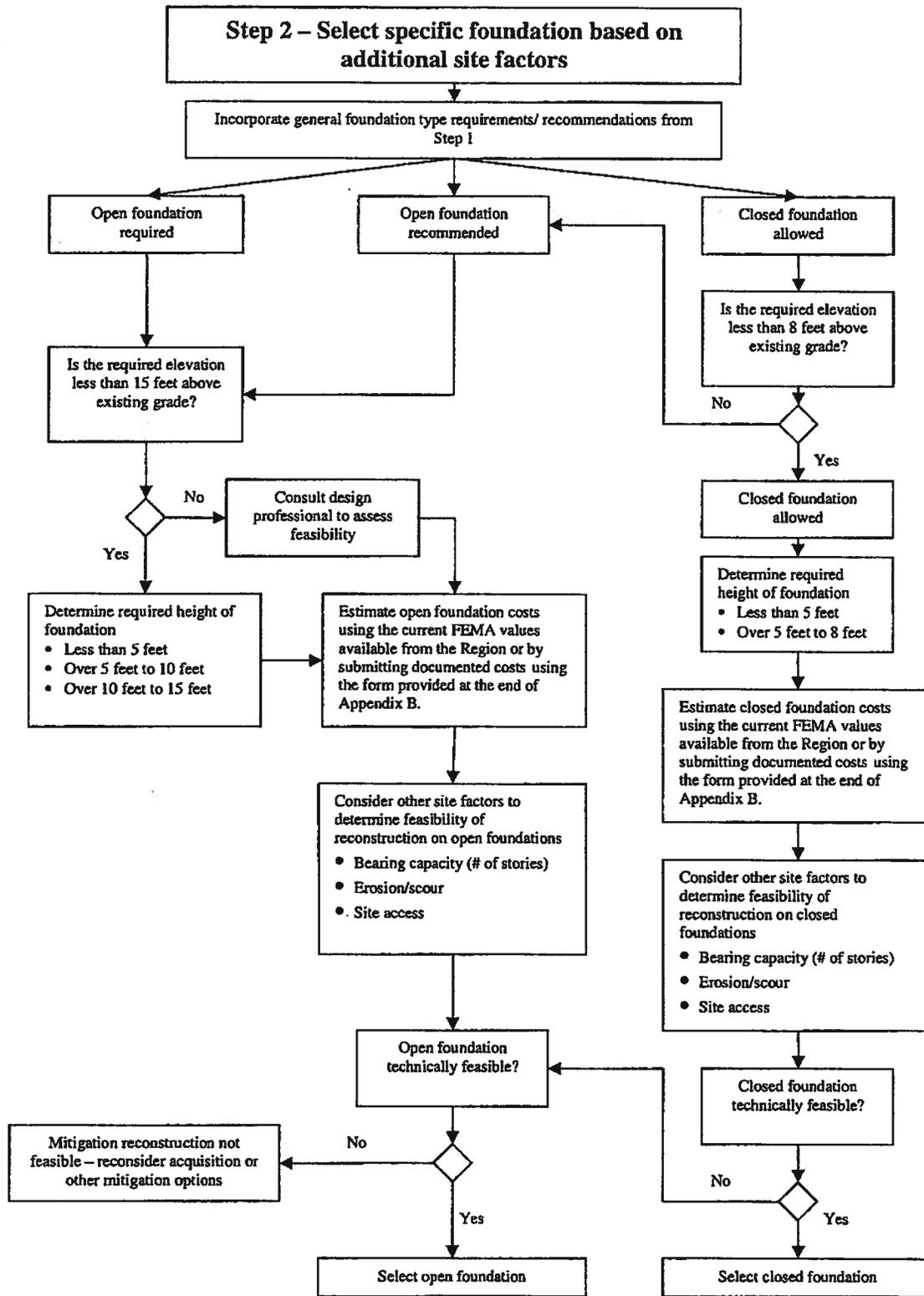


Figure 2-2. Flow Chart Showing Step 2 of the HMGP Reconstruction Project Scoping Process (Source: HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006)

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Tables and sketches of recommended open and closed foundation types are provided in Table 2-1 and Figures 2-3 to 2-9. For additional details, refer to Appendix B of HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006 (Sections B.1 to B.3 on pages 42-49) and Chapter 4 of FEMA Publication 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundations* dated July 2006 (Section 4.2 on pages 4-7 to 4-15).

Table 2-1. Recommended Open and Closed Foundation Types for Gulf Coast Construction
(Source: FEMA Publication 550, July 2006)

Foundation		Case	V Zones	A Zones in Coastal Areas	
Type	Description			Coastal A Zone	A Zone
Open (deep)	Timber pile	A	✓	✓	✓
	Steel pipe pile with concrete column and grade beam	B	✓	✓	✓
	Timber pile with concrete column and grade beam	C	✓	✓	✓
Open (shallow)	Concrete column and grade beam	D	NR	✓	✓
	Concrete column and grade beam with slab	G	NR	✓	✓
Closed (shallow)	Reinforced masonry - crawlspace	E	x	NR	✓
	Reinforced masonry - stem wall	F	x	NR	✓

✓ = Acceptable

NR = Not Recommended

x = Not Permitted

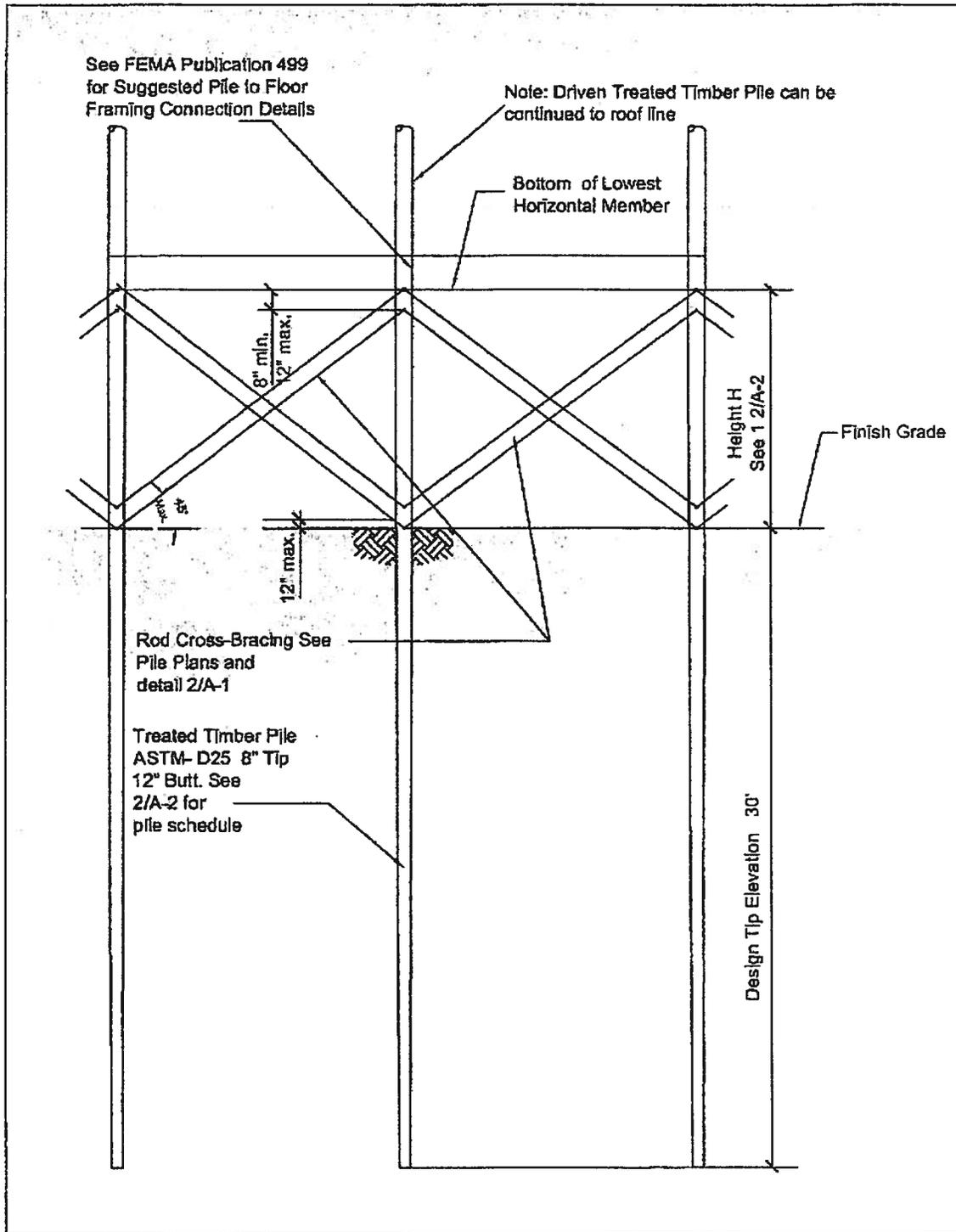


Figure 2-3. Profile of Open Foundation Case A (Source: FEMA Publication 550, July 2006)

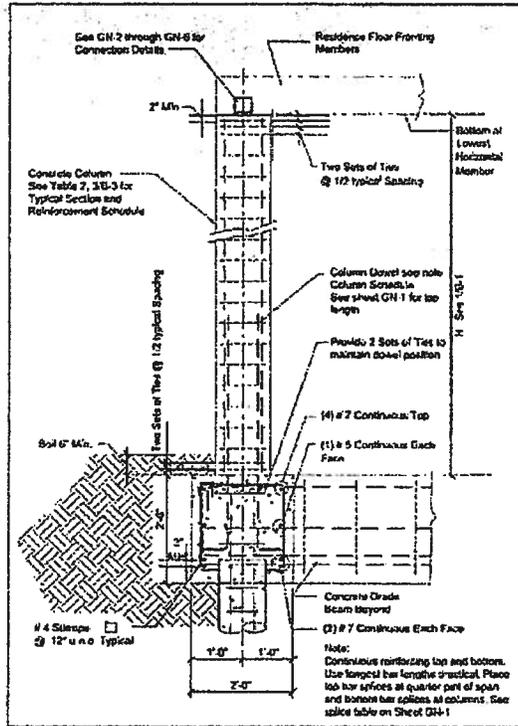


Figure 2-4. Profile of Open Foundation Case B (Source: FEMA Publication 550, July 2006)

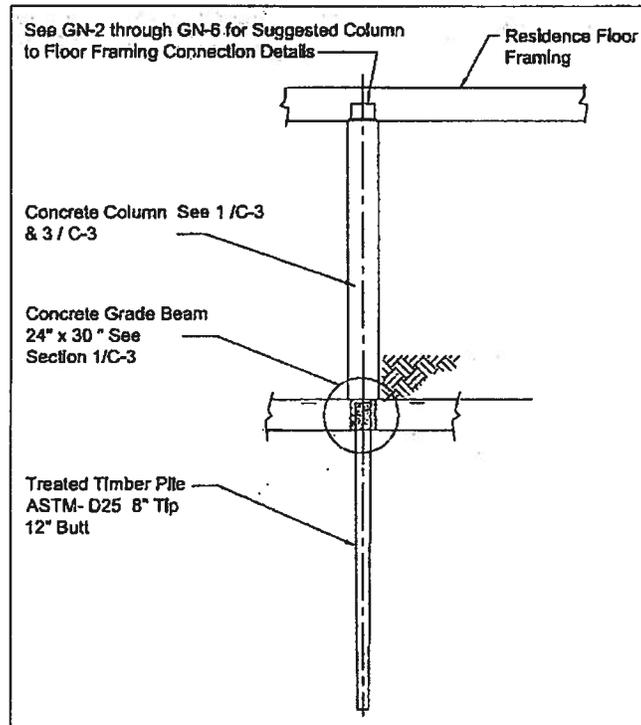


Figure 2-5. Profile of Open Foundation Case C (Source: FEMA Publication 550, July 2006)

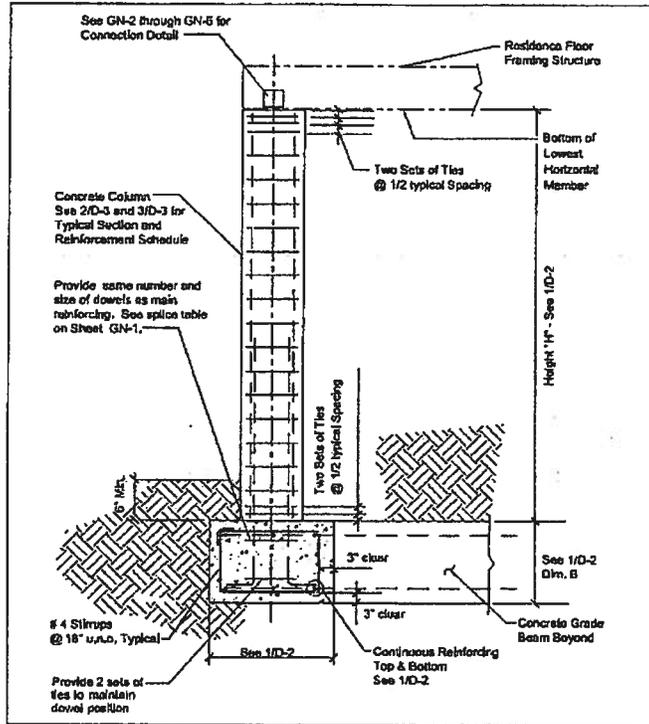


Figure 2-6. Profile of Open Foundation Case D (Source: FEMA Publication 550, July 2006)

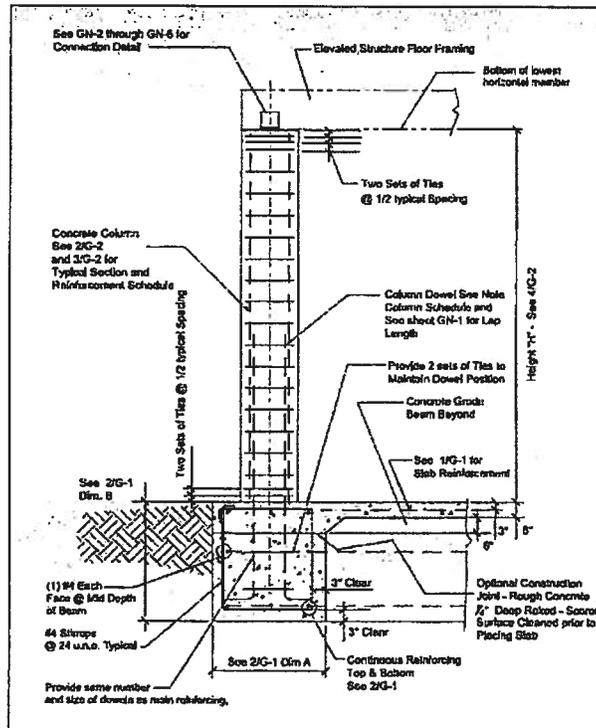


Figure 2-7. Profile of Open Foundation Case G (Source: FEMA Publication 550, July 2006)

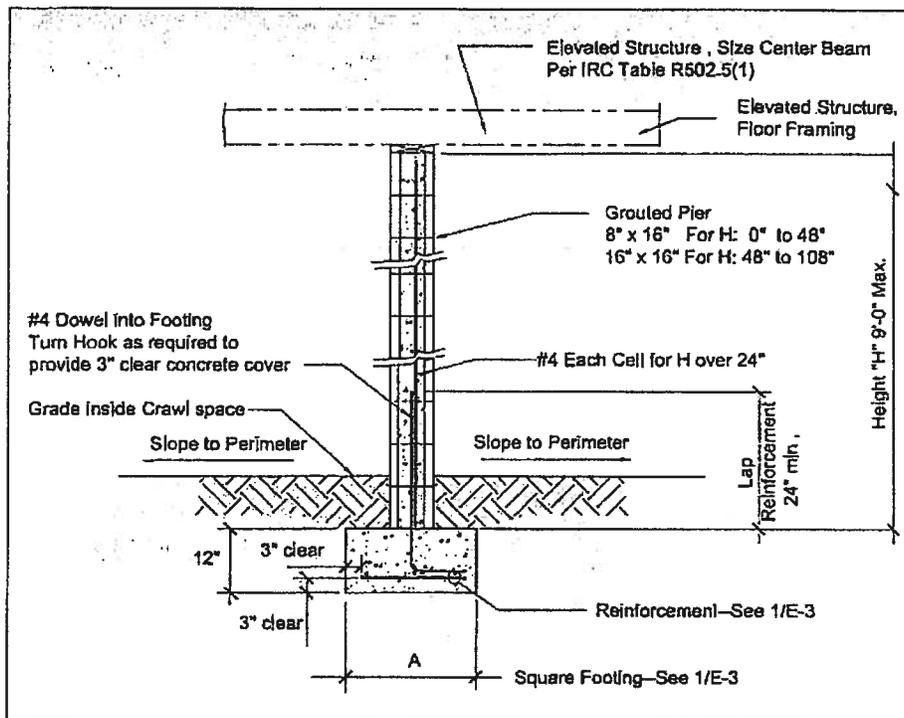


Figure 2-8. Profile of Closed Foundation Case E (Source: FEMA Publication 550, July 2006)

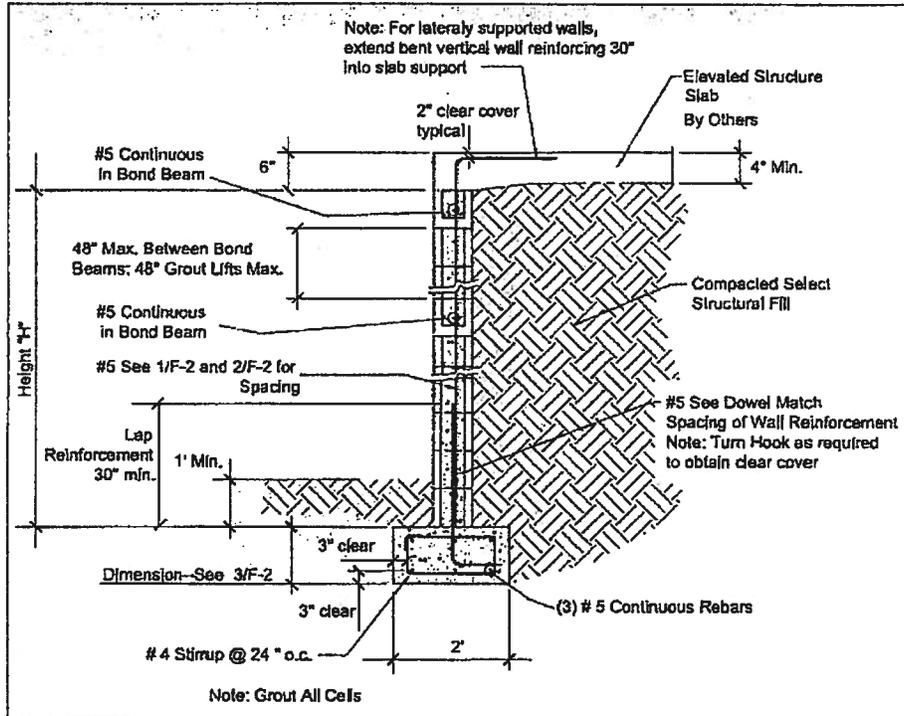


Figure 2-9. Profile of Closed Foundation Case F (Source: FEMA Publication 550, July 2006)

2.2. INTERMEDIATE STEPS

The intermediate steps in developing project unit cost estimates involve determining the FEMA unit cost estimates for the structure or structures to be included in the proposed project. The FEMA unit cost estimates are based on the curves provided in Section 3.0 of this document. Details regarding these intermediate steps are outlined below. Note that communities that submit project costs using FEMA unit cost estimate are not required to submit additional supporting cost documentation.

STEP 3: DETERMINE STRUCTURE SQUARE FOOTAGES

The third step in the development of project unit cost estimates is to determine structure square footages. Based on the results of preliminary steps 1 and 2, determine the building square footage for each structure or class of structures based on the foundation type (i.e., open vs. closed), foundation height (i.e., 0 to 5 feet, 5 to 10 feet, or 10 to 15 feet) and the number of stories (i.e., 1-story or 2-story).

STEP 4: SELECT APPROPRIATE FEMA UNIT COST GUIDANCE

The fourth step in the development of project unit cost estimates is to select the appropriate FEMA unit cost guidance to estimate the unit costs. Based on the results of Step 3, select the appropriate FEMA unit cost data chart(s) based on the foundation type (i.e., open vs. closed), foundation height (i.e., 0 to 5 feet, 5 to 10 feet, or 10 to 15 feet) and the number of stories (i.e., 1-story or 2-story). The FEMA unit cost data charts are provided in Section 3.0 of this document.

STEP 5: ESTABLISH FEMA BASE UNIT COST ESTIMATES

The fifth step in the development of project unit cost estimates is to establish the base unit cost estimate for each structure type. Using the appropriate FEMA unit cost data chart from Step 4, establish the FEMA base unit cost as follows.

PART A. Refer to the appropriate FEMA unit cost data chart provided in Section 3.0 of this document, and verify the data chart page is oriented in the landscape position.

PART B. Locate the "Area (SF)" coordinate line along the bottom of the chart. Find the point along this line where the Area (SF) value matches the square footage value determined in Step 3, then use a pencil to trace a vertical line up from that point.

PART C. Find the point where the line traced in Part B intersects the line on the chart, then use a pencil to trace a horizontal line from that point to the left hand side of the chart.

PART D. Locate the "Unit Cost (\$/SF)" coordinate line along the left hand side of the chart. Find the point where the horizontal line traced in Part C intersects this line, and record the Unit Cost (\$/SF) value at this point. This value represents the FEMA base unit cost for an average quality house as defined in the HMGP Reconstruction Grant Pilot Guidance.

STEP 6: DETERMINE FEMA UNIT COST ESTIMATES

The sixth step in the development of project unit cost estimates is to determine the FEMA unit cost estimate for each structure type by location. Based on the results of Step 5, multiply the FEMA base unit cost obtained in Step 5 by the appropriate location factor from Table 2-2 to determine the FEMA unit cost for the applicable city and county.

Table 2-2. Location Factors to Adjust FEMA Base Unit Costs by City and County (Source: R.S. Means Square Foot Costs, November 2006)

STATE	City/Location	Factor	Counties						
Texas	McAllen	0.826	Willacy	Hidalgo	Starr	Kenedy	Brooks	Jim Hogg	Victoria
	Corpus Christi	0.850	Kleberg	Duval	Nueces	Jim Wells	San Patricio	Live Oak	
	Galveston	0.943	Refugio	Bea	Calhoun	Goliad	DeWitt	Calhoun	
	Houston	0.961	Jackson	Lavaca	Matagorda	Wharton	Brazoria	Galveston	Jefferson
	Beaumont	0.904	Fort Bend	Harris	Montgomery	Liberty	Chambers	San Jacinto	
Louisiana			Jefferson	Orange	Hardin	Jasper	Newton	Tyler	
	Lake Charles	0.907	Cameron	Calcasieu	Beauregard	Jefferson Davis	Allen		
	Lafayette	0.891	Vermilion	Iberia	Acadia	Lafayette	St. Martin	St. Landry	
	Baton Rouge	0.904	Iberville	West Baton Rouge	East Baton Rouge		Livingston	Ascension	
	Hammond	0.879	Tangipahoa	St. Tammany	Washington				
	Thibadoux	0.920	Assumption	St. John the Baptist	St. James	St. Charles	Terrebonne	St. Mary	
Mississippi	New Orleans	0.949	Lafourche						
	Biloxi	0.870	Jefferson	Plaquemines	Orleans	St. Bernard			
Alabama	Mobile	0.928	Hancock	Harrison	Jackson	Paarl River	Stone	George	
	Dothan	0.852	Mobile	Baldwin	Washington	Clarke	Escambia	Covington	Conecuh
Florida	Pensacola	0.930	Houston	Geneva	Coffee	Dale	Henry		
	Panama City	0.851	Escambia	Santa Rosa	Okalooosa	Walton			
	Tallahassee	0.867	Bay	Washington	Holmes	Gulf	Calhoun	Jackson	
			Leon	Gadsden	Liberty	Franklin	Wakulla	Jefferson	Madison
			Taylor	Hamilton	Suwannee				
	Gainesville	0.954	Alachua	Lafayette	Gilchrist	Dixie	Levy	Marion	Bradford
	St. Peterburg	0.912	Citrus	Sumler	Hernando	Pinellas			
	Tampa	1.001	Hillsborough	Pasco	Polk				
Sarasota	0.964	Sarasota	Manatee	Hardee	DeSoto	Charlotte	Glades		
Ft. Myers	0.948	Lee	Henry	Collier	Monroe				

STEP 7: EVALUATE FEMA UNIT COST ESTIMATES

The seventh step in the development of project unit cost estimates is to review and evaluate the FEMA unit cost estimates for each structure type by location. Based on the results of Step 6, review the FEMA unit cost estimates determined in Step 6 and evaluate by location based on one of the following two options:

OPTION A. If the applicant believes that the FEMA unit cost determined in Step 6 is adequate to design, construct and inspect the proposed project in accordance with the design, construction and inspection requirements of the HMGP Reconstruction Grant Pilot Guidance, then the FEMA unit cost can be considered acceptable for use in the grant application submittal.

OPTION B. If the applicant does not believe that FEMA unit cost determined in Step 6 is adequate to design, construct and inspect the proposed project in strict accordance with the design, construction and inspection requirements of the HMGP Reconstruction Grant Pilot Guidance, then the applicant must prepare their own unit cost estimate using the process outlined in Section 2.3.

2.3. FINAL STEPS (OPTIONAL)

The final, optional steps in developing project unit cost estimates involve following the cost estimating process found in the HMGP Reconstruction Grant Pilot Guidance to prepare an applicant unit cost estimate for the structure or structures to be included in the proposed project.

These steps are to be followed in the event that the applicant does not believe that FEMA unit cost determined in Step 6 is adequate to design, construct and inspect the proposed project in strict accordance with the design, construction and inspection requirements of the HMGP Reconstruction Grant Pilot Guidance. Details regarding these final, optional steps are outlined below. Note that communities that submit project costs using an applicant cost estimate are required to submit additional supporting cost documentation as part of the grant application.

STEP 8: PREPARE APPLICANT COST ESTIMATES (OPTIONAL)

The eighth step in the development of project unit cost estimates is to prepare applicant cost estimates for the project structure(s) based on foundation type, foundation height and number of stories. Based on the results of the preliminary steps (Steps 1 and 2), follow the project cost estimating process in Appendix B of the HMGP Reconstruction Grant Pilot Guidance dated June 23, 2006 (Section B.4 on pages 49-52) to prepare a documented applicant cost estimate for the structure or structures associated with the proposed project based on the foundation type (i.e., open vs. closed), foundation height (i.e., 0 to 5 feet, 5 to 10 feet, or 10 to 15 feet) and the number of stories (i.e., 1-story or 2-story). Be sure to include the following costs listed in Table 2-1 of the HMGP Reconstruction Grant Pilot Guidance (Section 2.1 on pages 16-17) that are included in the \$150,000 Federal share funding limit:

- Pre-construction
- Site preparation
- Foundation
- Structural shell
- Interior finishes
- Construction completion

STEP 9: DETERMINE APPLICANT UNIT COST ESTIMATES (OPTIONAL)

The ninth step in the development of project unit cost estimates is to determine the applicant unit cost for the structure(s) based on square footage, foundation type, foundation height, number of stories. Based on the results of Step 3 and Step 8, divide the total applicant cost estimate in Step 8 by the square footage in Step 3 to determine the applicant unit cost for the structure(s) based on the foundation type (i.e., open vs. closed), foundation height (i.e., 0 to 5 feet, 5 to 10 feet, or 10 to 15 feet) and the number of stories (i.e., 1-story or 2-story).

STEP 10: EVALUATE APPLICANT UNIT COST ESTIMATES (OPTIONAL)

The tenth step in the development of project unit cost estimates is to review and evaluate the applicant unit cost estimates for each structure type by location. This evaluation should be conducted by the sub-applicant prior to the submission of the applicant unit cost estimate that is to be submitted to the State and FEMA as part of the application review process. Based on the results of Step 6 and Step 9, compare applicant's unit cost determined in Step 9 with the FEMA unit cost determined in Step 6 and evaluate based on one of the following three options:

OPTION A. If the applicant's unit cost in Step 9 is between 80 and 100 percent of the FEMA unit cost in Step 6, then the FEMA unit cost can be considered acceptable for use in the grant application submittal.

OPTION B. If the applicant's unit cost in Step 9 is less than 80 percent of the FEMA unit cost in Step 6, then the FEMA unit cost may be considered acceptable for use in the grant application submittal. However, in accordance with the HMGP Reconstruction Grant Pilot Guidance, the applicant's unit cost data should be reviewed to verify that all eligible building costs necessary to complete the project are included in the applicant's estimated value.

OPTION C. If the applicant's unit cost in Step 9 is greater than the FEMA unit cost in Step 6, then the applicant cost may be considered acceptable for use in the grant application submittal, provided the sub-applicant can provide additional data to verify the source documentation, credibility and eligibility of the values included in the applicant's unit cost. FEMA will evaluate all applicants' unit cost data for accuracy as part of the application review. Unit cost values that are not documented or supported will not be allowed. Also, note that this process only results in a cost estimate; only actual incurred costs will be reimbursed under the HMGP Reconstruction Grant Pilot.

SECTION 3. FEMA UNIT COST DATA CHARTS

This section provides the current FEMA unit cost estimate charts for projects submitted under FEMA's HMGP Reconstruction Grant Pilot. As stated in Section 1.3 of this document, FEMA has prepared unit cost data charts for open and closed foundation structures for foundation heights of 0 to 5 feet, 5 to 10 feet and 10 to 15 feet in accordance with Section 2.5 of the HMGP Reconstruction Grant Pilot Guidance. The unit cost data charts were developed based on R.S. Means *Square Foot Costs* (2006) for an average quality of construction as defined by the guidance, with adjustments based on R.S. Means (2006) cost data to account for elevated open or closed foundation construction. The current FEMA unit cost data charts are listed below and presented in Figures 3-1 through 3-10. It is anticipated that Figures 3-1 through 3-10 will be updated every three months by FEMA based on quarterly cost adjustments along with the local multipliers provided by R.S. Means.

FEMA Unit Cost Data Charts for the HMGP Reconstruction Grant Pilot

- Figure 3-1: FEMA Unit Cost Data for 1-Story House with Open Foundation, Elevation Range: 0 to 5 feet
- Figure 3-2: FEMA Unit Cost Data for 1-Story House with Open Foundation, Elevation Range: 5 to 10 feet
- Figure 3-3: FEMA Unit Cost Data for 1-Story House with Open Foundation, Elevation Range: 10 to 15 feet
- Figure 3-4: FEMA Unit Cost Data for 1-Story House with Closed Foundation, Elevation Range: 0 to 5 feet
- Figure 3-5: FEMA Unit Cost Data for 1-Story House with Closed Foundation, Elevation Range: 5 to 10 feet
- Figure 3-6: FEMA Unit Cost Data for 2-Story House with Open Foundation, Elevation Range: 0 to 5 feet
- Figure 3-7: FEMA Unit Cost Data for 2-Story House with Open Foundation, Elevation Range: 5 to 10 feet
- Figure 3-8: FEMA Unit Cost Data for 2-Story House with Open Foundation, Elevation Range: 10 to 15 feet
- Figure 3-9: FEMA Unit Cost Data for 2-Story House with Closed Foundation, Elevation Range: 0 to 5 feet
- Figure 3-10: FEMA Unit Cost Data for 2-Story House with Closed Foundation, Elevation Range: 5 to 10 feet

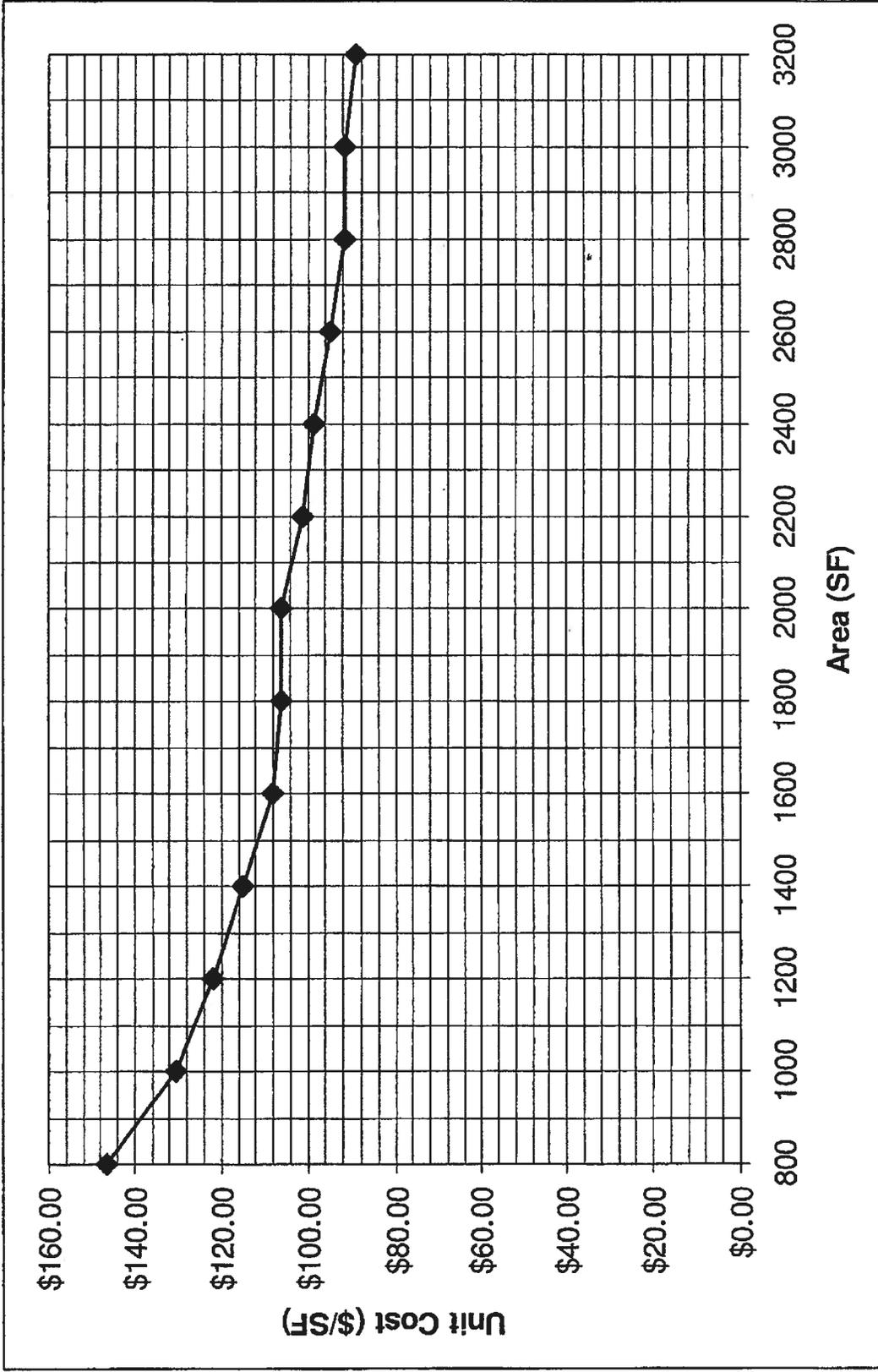


Figure 3-1: FEMA Unit Cost Data for 1-Story House with Open Foundation, Elevation Range: 0 to 5 feet (Source: R.S. Means Unit Cost Data, November 2006)

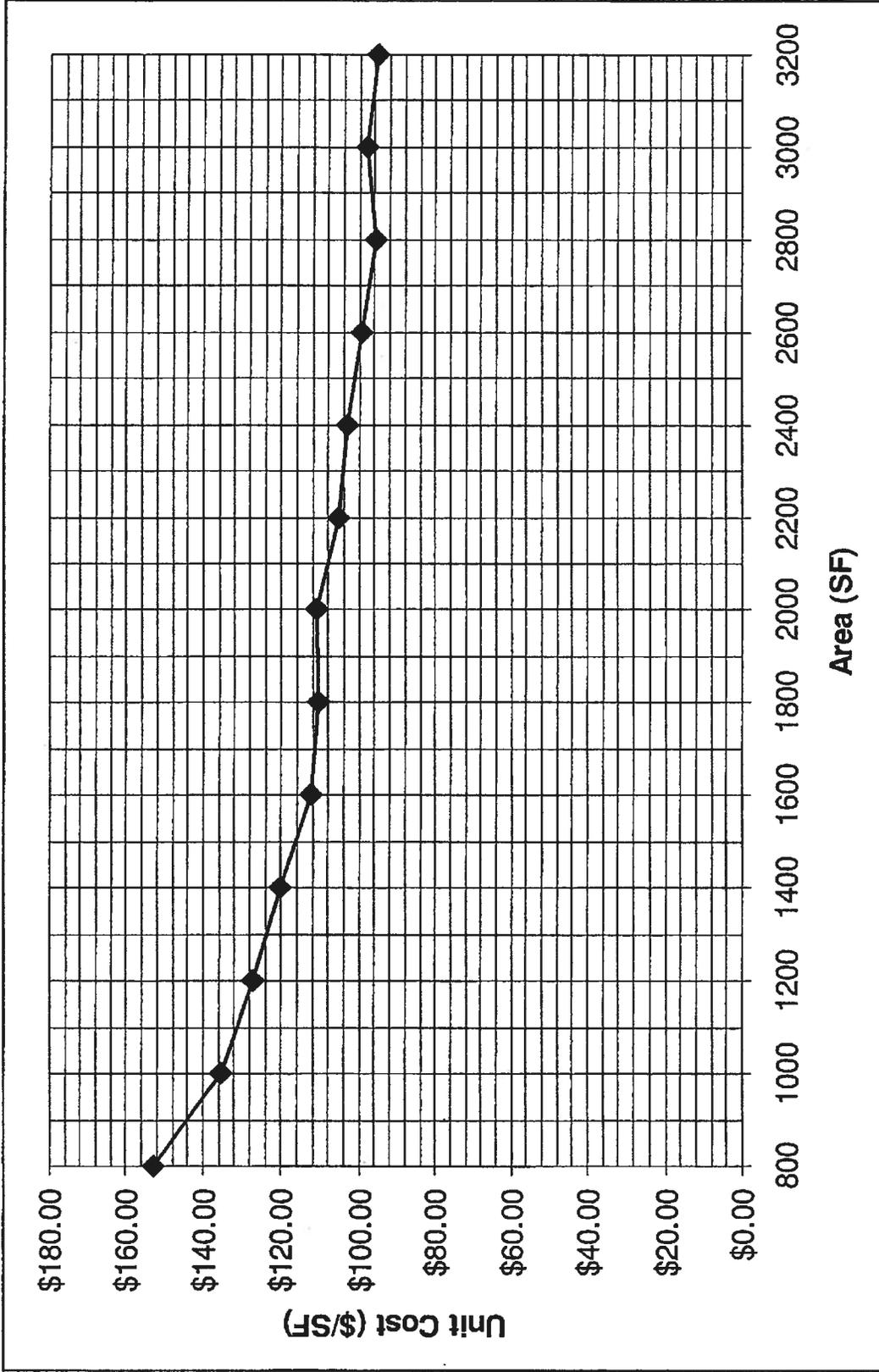


Figure 3-2: FEMA Unit Cost Data for 1-Story House with Open Foundation, Elevation Range: 5 to 10 feet (Source: R.S. Means Unit Cost Data, November 2006)

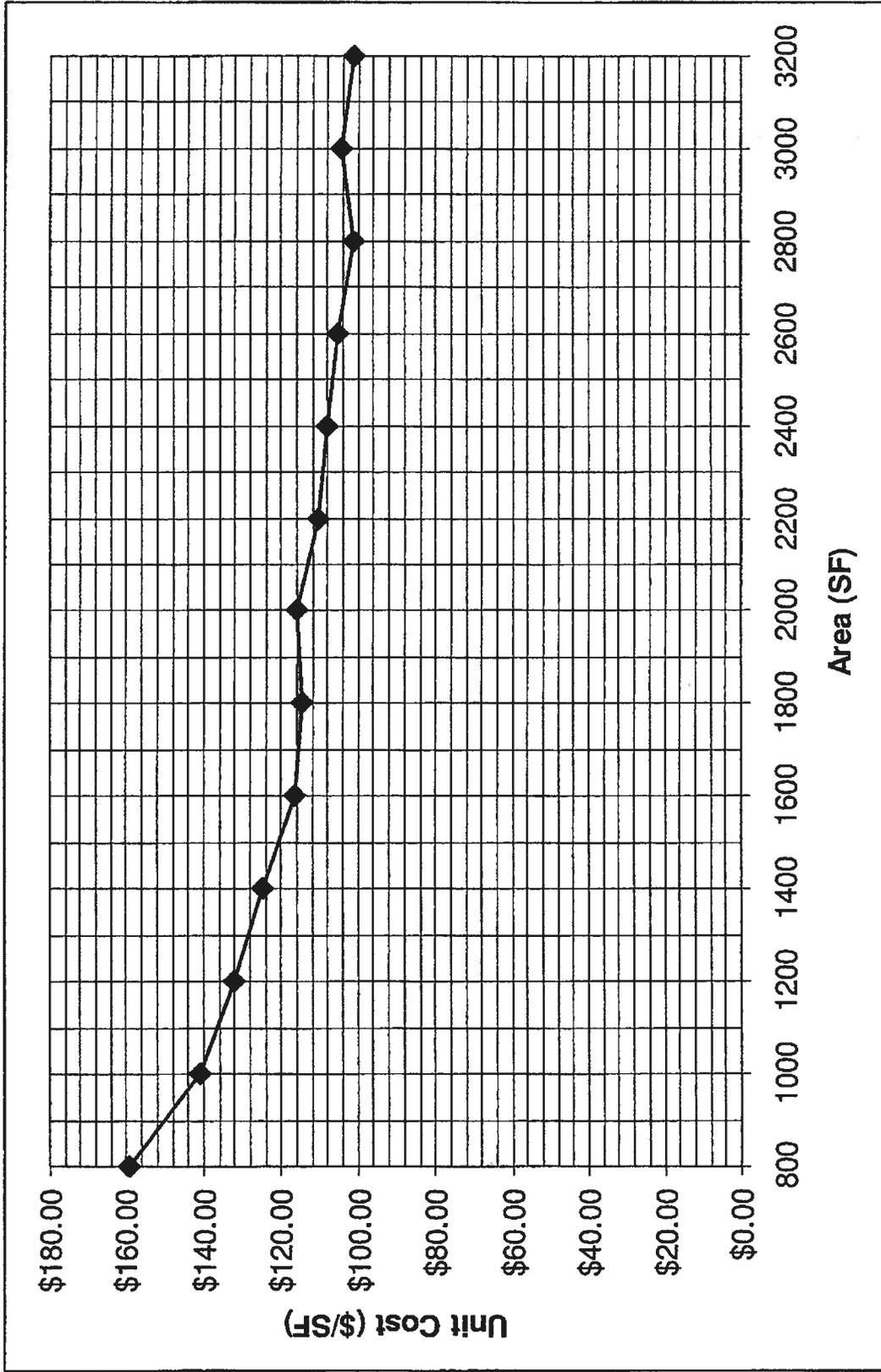


Figure 3-3: FEMA Unit Cost Data for 1-Story House with Open Foundation, Elevation Range: 10 to 15 feet (Source: R.S. Means *Unit Cost Data*, November 2006)

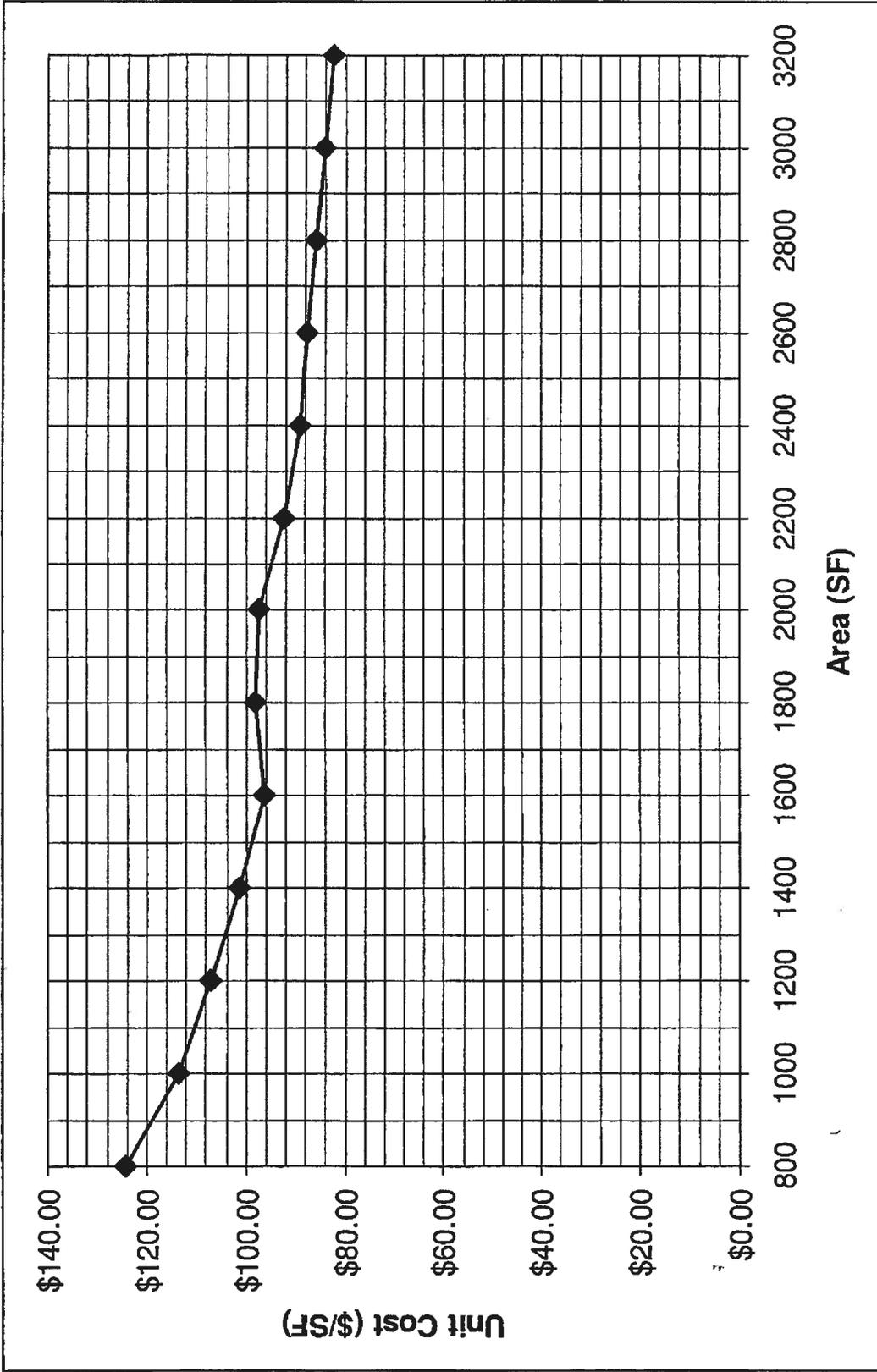


Figure 3-4: FEMA Unit Cost Data for 1-Story House with Closed Foundation, Elevation Range: 0 to 5 feet (Source: R.S. Means Unit Cost Data, November 2006)

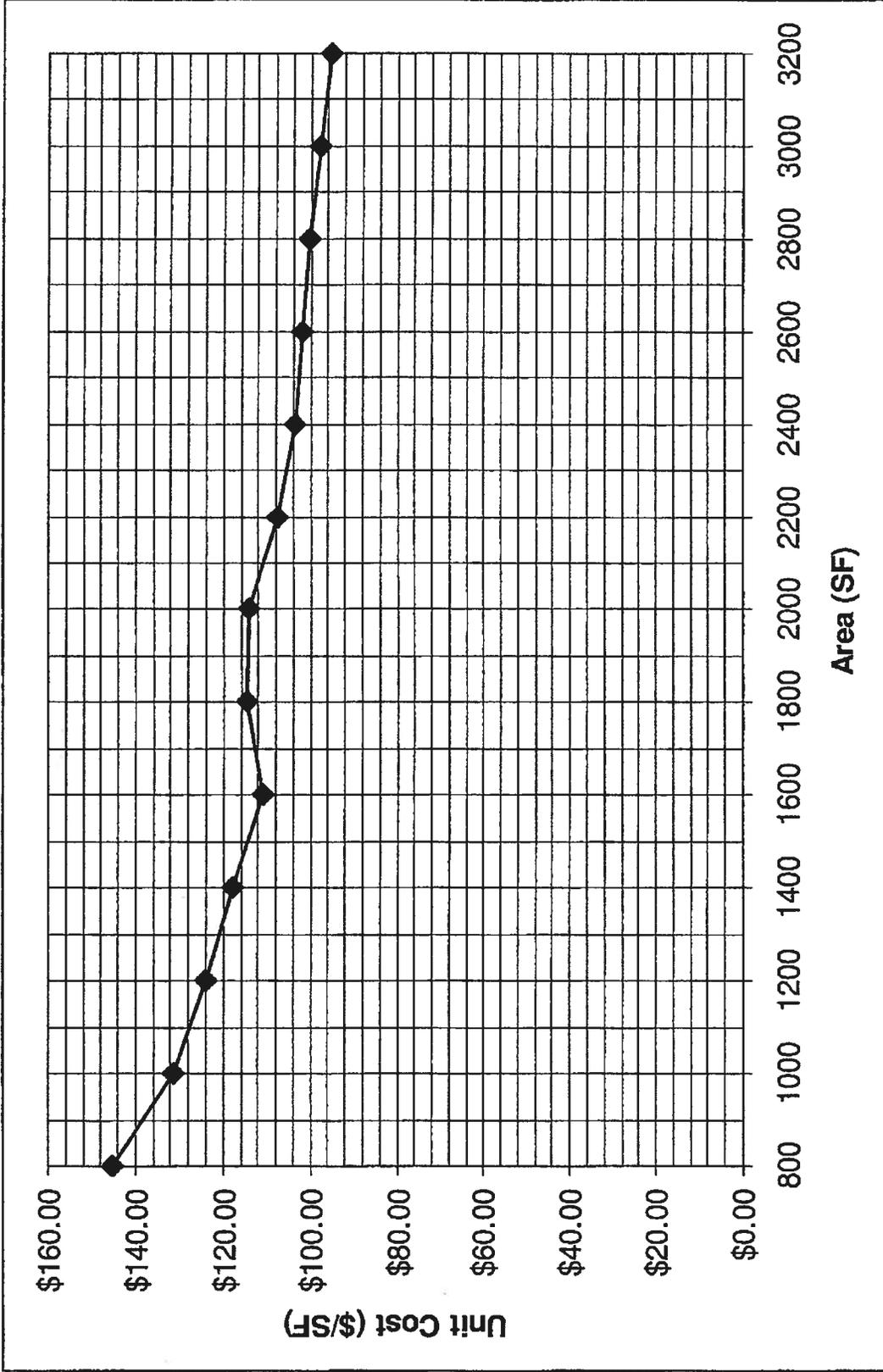


Figure 3-5: FEMA Unit Cost Data for 1-Story House with Closed Foundation, Elevation Range: 5 to 10 feet (Source: R.S. Means *Unit Cost Data*, November 2006)

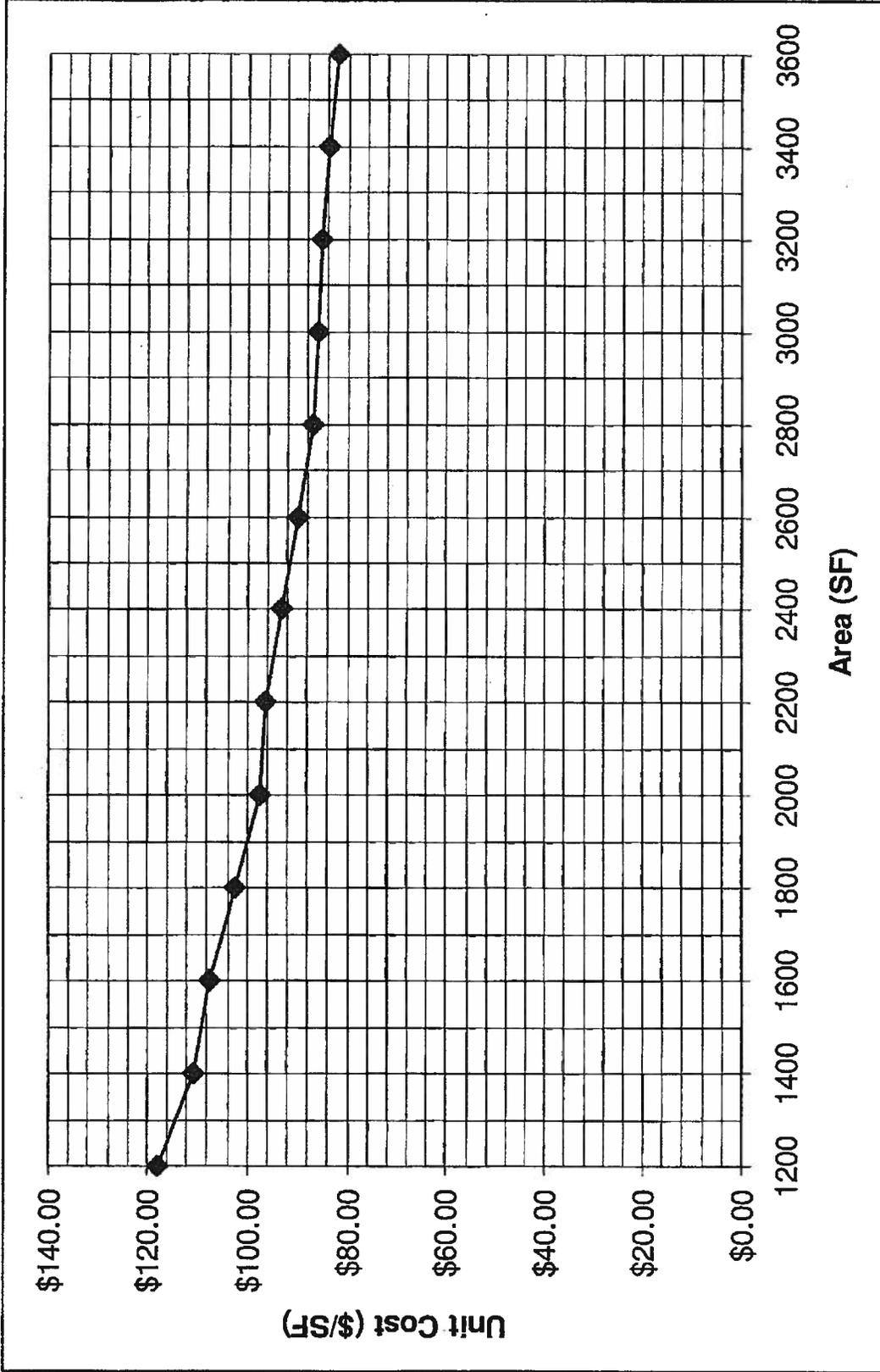


Figure 3-6: FEMA Unit Cost Data for 2-Story House with Open Foundation, Elevation Range: 0 to 5 feet (Source: R.S. Means Unit Cost Data, November 2006)

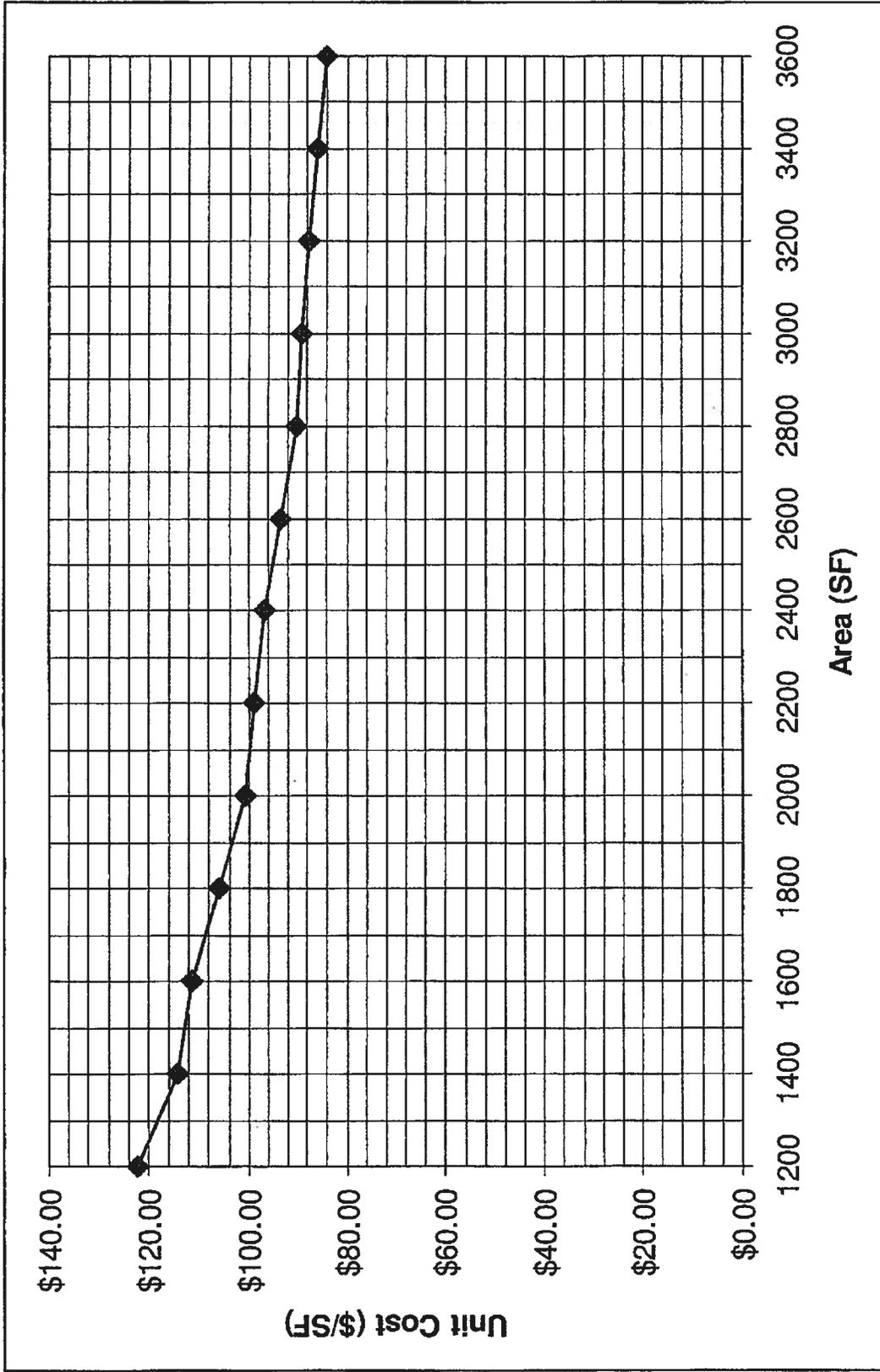


Figure 3-7: FEMA Unit Cost Data for 2-Story House with Open Foundation, Elevation Range: 5 to 10 feet (Source: R.S. Means Unit Cost Data, November 2006)

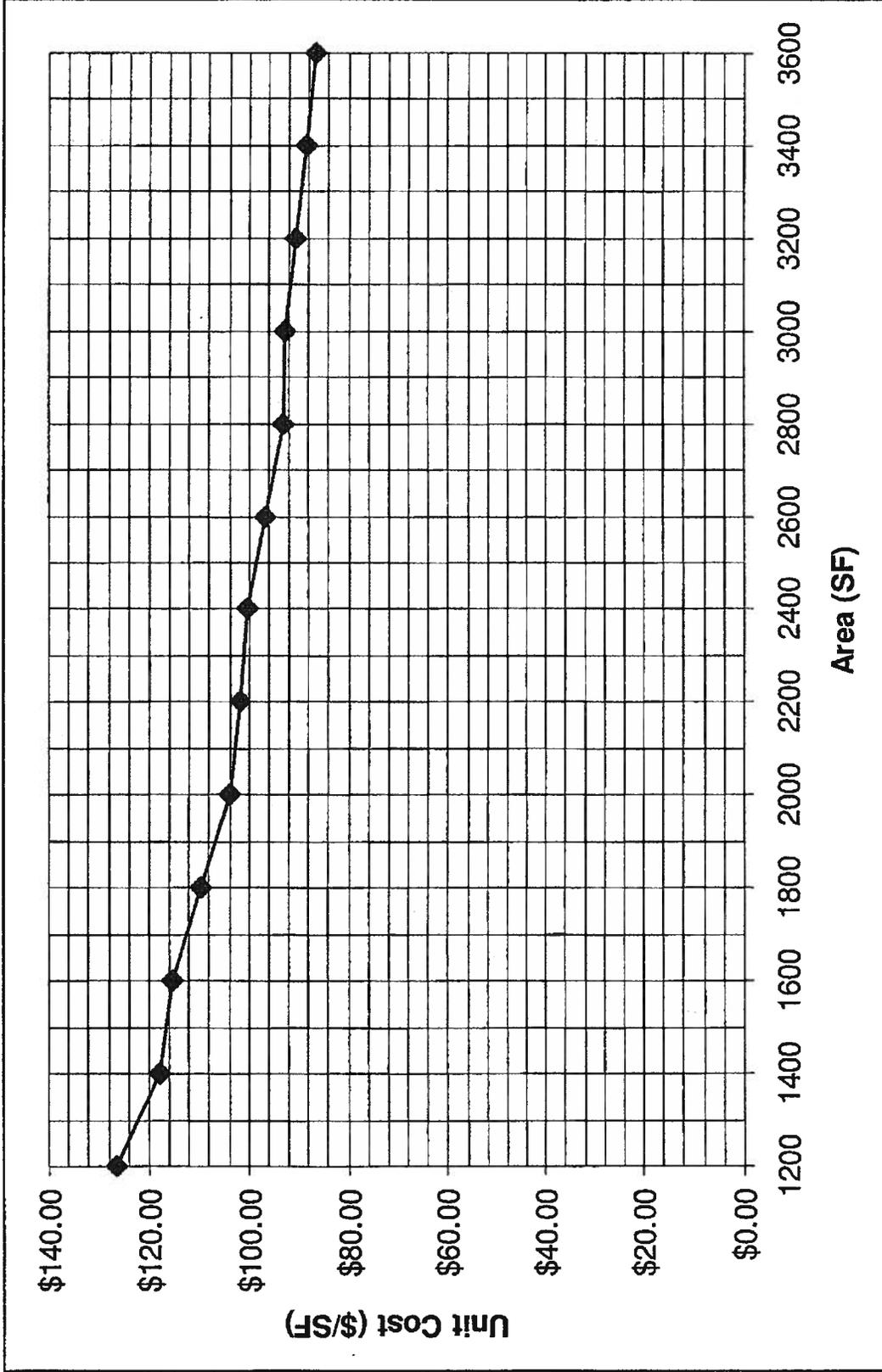


Figure 3-8: FEMA Unit Cost Data for 2-Story House with Open Foundation, Elevation Range: 10 to 15 feet (Source: R.S. Means Unit Cost Data, November 2006)

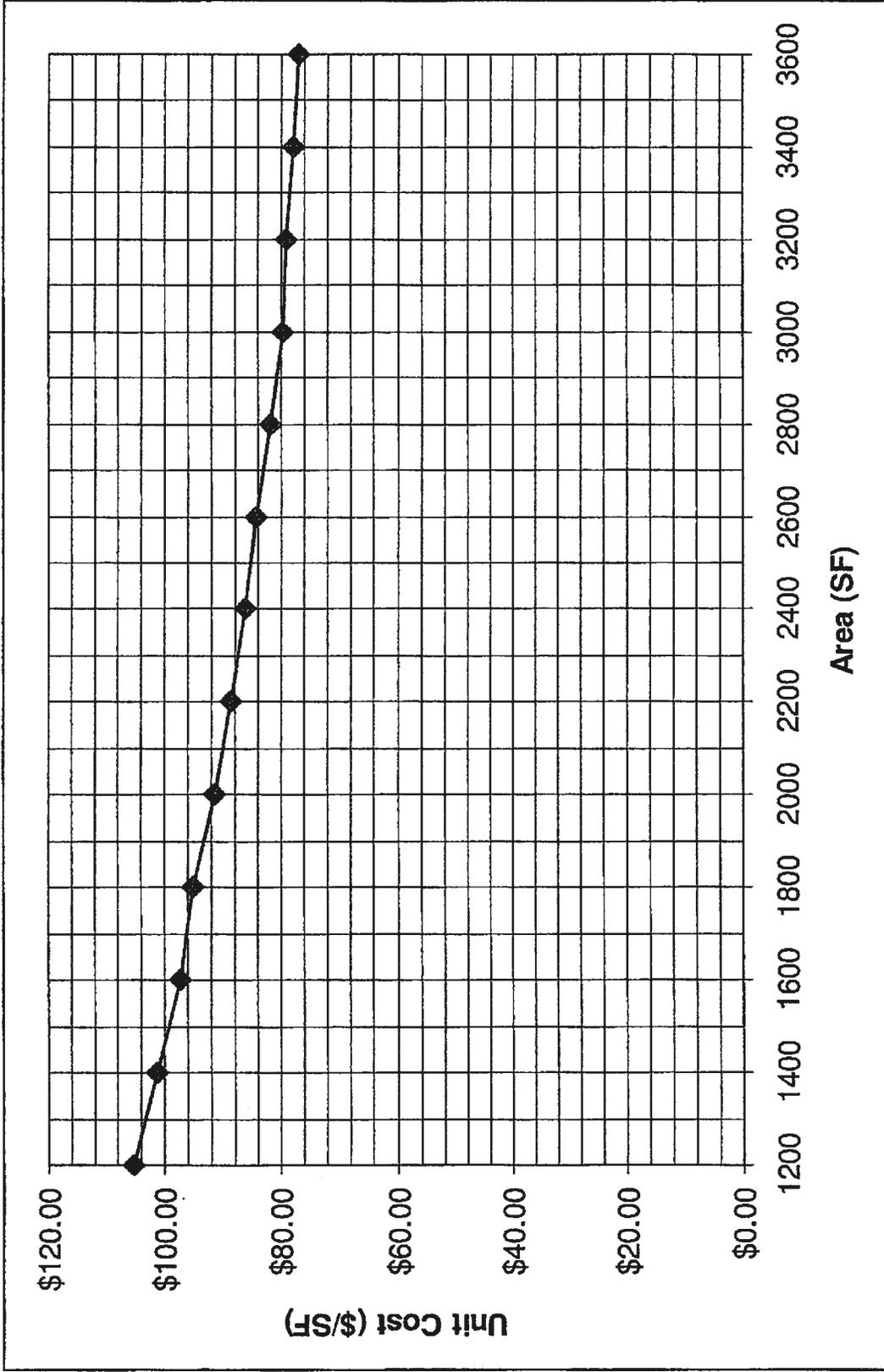


Figure 3-9: FEMA Unit Cost Data for 2-Story House with Closed Foundation, Elevation Range: 0 to 5 feet (Source: R.S. Means Unit Cost Data, November 2006)

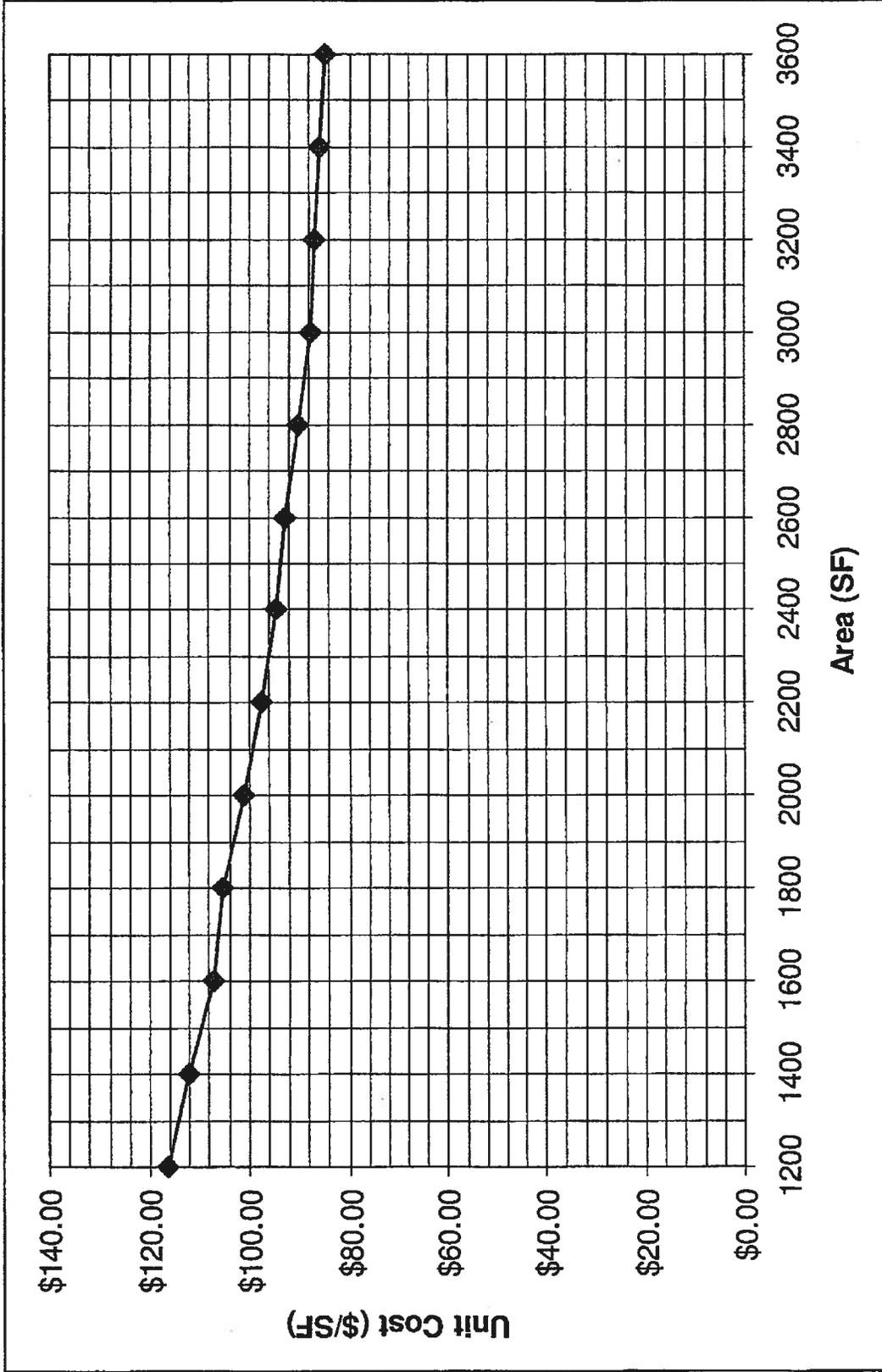


Figure 3-10: FEMA Unit Cost Data for 2-Story House with Closed Foundation, Elevation Range: 5 to 10 feet (Source: R.S. Means *Unit Cost Data*, November 2006)

APPENDIX. PORTIONS OF APPENDIX B OF HMGP RECONSTRUCTION GRANT PILOT GUIDANCE DATED JUNE 23, 2006, SECTIONS B.1-B.4, PAGES 42-50

PROJECT SCOPING PROCESS

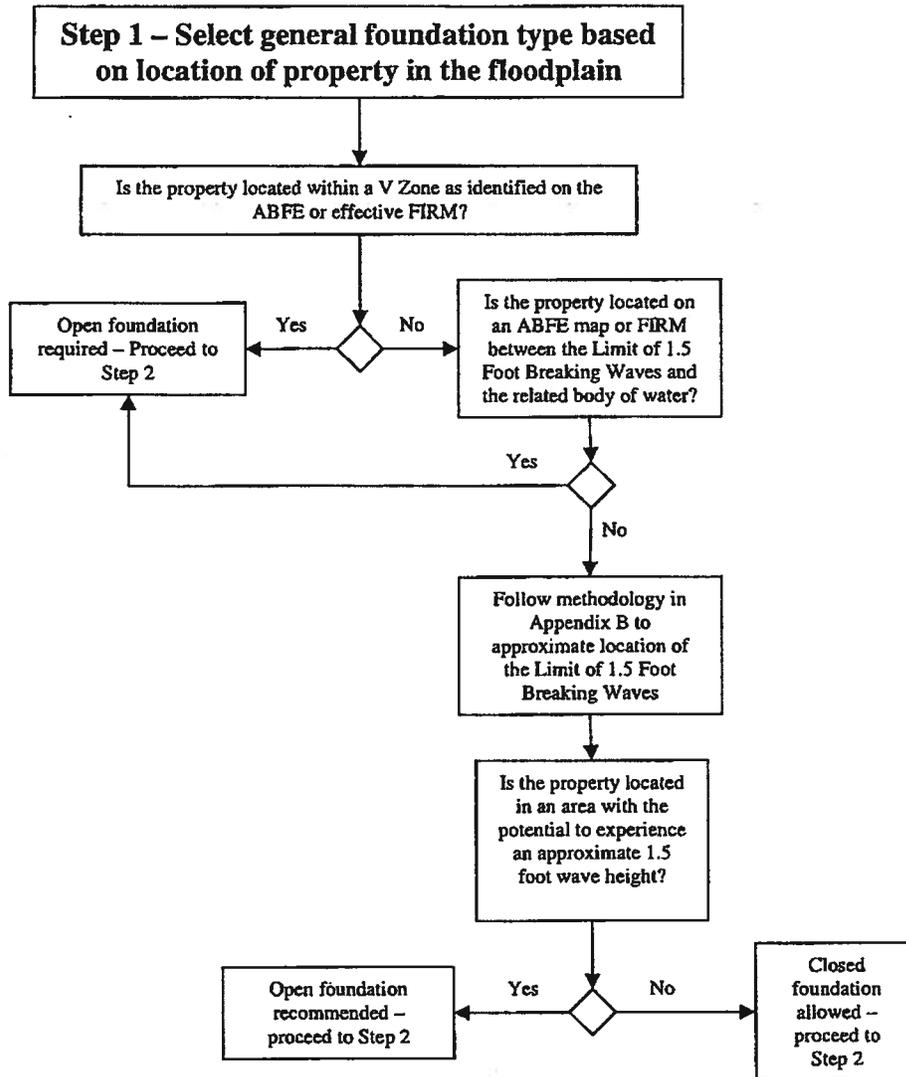
Two critical elements of project design must be established during project scoping: the required foundation type and foundation height for the structure. Although many variations exist between different types of foundations, for the purpose of project scoping, foundations will be grouped into two primary categories: open foundations and closed foundations.

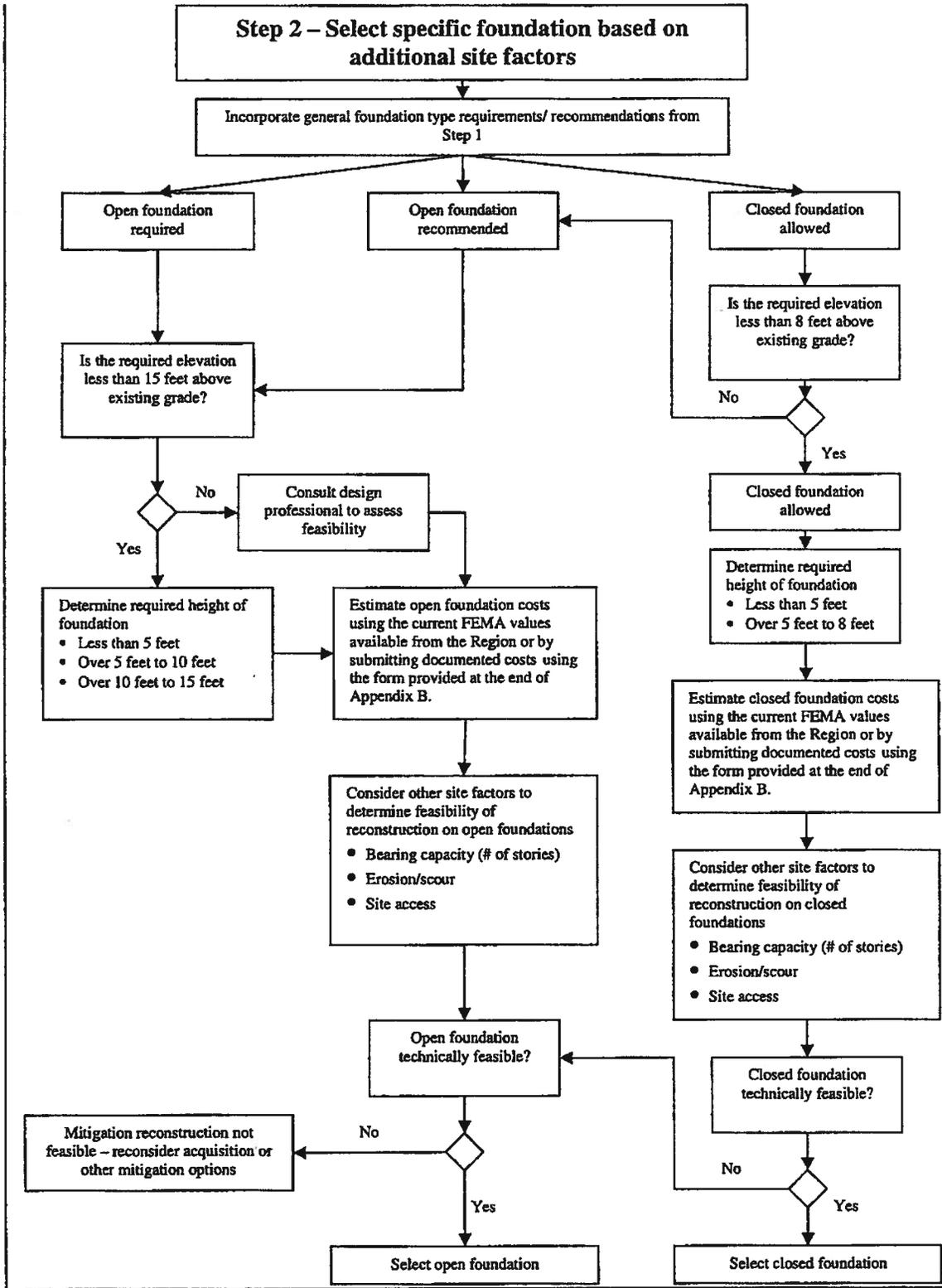
The required height of the foundation is a critical factor in determining the type and cost of the foundation required. The required height will be determined based on the elevation requirement above existing ground elevation as dictated by local floodplain management criteria, specific program criteria, and the provisions of all applicable codes.

The purpose of the following flow chart is to assist potential Applicants through the project scoping process. By using this flow chart, the Applicant can identify the basic design parameters for individual structures that may be included in a potential application. The results of this flow chart will directly facilitate the development of a cost estimate and facilitate grouping potential structures into categories for which variations of cost are expected. Following this flow chart, detailed instructions are presented to provide additional guidance.

NOTE: The use of this flow chart does not replace the requirement for detailed engineering design of mitigation reconstruction projects. The flow chart is a guide through the project development process to confirm feasibility and aid in cost estimation. If the project is approved, a detailed project design would be required during implementation.

SCOPING PROCESS FLOW CHART





SCOPING PROCESS FLOW CHART INSTRUCTIONS

STEP 1 – Select general foundation type based on location of property in the floodplain

The first step is to obtain the latest up-to-date floodplain mapping for the community. The local floodplain administrator or building official may be able to provide this information. In the States of Mississippi and Louisiana, ABFEs may have been established following Hurricanes Katrina or Rita (see Section 2.3.4.).

Once the current floodplain mapping for the community has been identified, locate the specific property on the map and identify the appropriate flood zone. The potential scenarios are outlined below:

V Zones:

If the property is identified on the ABFE or FIRM as being located in a V Zone, then an open foundation will be required that can resist all flood forces as well as erosion and scour. *Proceed to Step 2.*

Limit of 1.5 Foot Breaking Waves:

- If the property is identified on the ABFE or FIRM as being located in an area between the Limit of 1.5 Foot Breaking Waves and the related water body, then an open foundation will be required that can resist all flood forces as well as erosion and scour. *Proceed to Step 2.*
- If there is no Limit of 1.5 foot Breaking Waves identified for the property on the FIRM or ABFE, use the following procedure to approximate the location of the Limit of 1.5 foot Breaking Waves for an A Zones that are located adjacent to V Zones on the ABFE or effective FIRM:
 1. Determine the Stillwater Elevation for the 100-year flood event for the property from the Flood Insurance Study (FIS) or determine the post-Katrina Still water Elevation from the Flood Recovery Guidance if appropriate. For post-Katrina Stillwater Elevations for open coast areas and back bay areas in Mississippi, refer to the Flood Recovery Guidance on the FEMA website (http://www.fema.gov/rebuild/mat/mat_katrina.shtm).
 2. Determine the lowest ground surface elevation for the property from a licensed surveyor or a topographic map with 1 foot contours.
 3. Measure the elevation difference between the Stillwater Elevation and the lowest ground service elevation.
 4. If the elevation difference is 2 feet or greater, then the property can be assumed to be in an area with the potential to experience 1.5 foot breaking waves. If the elevation difference is less than 2 feet, then the property can be assumed to be outside of the area with potential to experience 1.5 foot breaking waves.

- If the property is determined as being located in an area with the potential to experience 1.5 foot breaking waves using the above procedure, then an open foundation is recommended that can resist all flood forces as well as erosion and scour. *Proceed to Step 2.*

A Zones (Outside Limit of 1.5 Foot Breaking Waves):

- If the property is identified on the ABFE or effective FIRM as being located in an A Zone that is not adjacent to a V Zone, then a closed foundation is allowed. *Proceed to Step 2.*
- If the property is identified on the ABFE as being located outside of the Limit of 1.5 Foot Breaking Waves, then a closed foundation is allowed. *Proceed to Step 2.*
- If the property is determined as being located outside a an area with the potential to experience 1.5 foot breaking waves using the above procedure, then a closed foundation is allowed. *Proceed to Step 2.*

STEP 2 – Select specific foundation based on additional site factors

The next step is to determine the required foundation height and cost. The potential scenarios for open and closed foundations are outlined below:

Open Foundation Required or Recommended

- **Estimating height:** If an open foundation is required or recommended based on Step 1, determine the required elevation height of the foundation. This can be done by acquiring the ABFE from the Katrina flood recovery data on the FEMA website (http://www.fema.gov/rebuild/mat/mat_katrina.shtml) or the BFE from the FIRM if an ABFE has not been determined for site. Since the ABFEs and FIRM BFEs are measured relative to North American Vertical Datum (NAVD88) (or roughly sea level), the ground surface elevations are needed to determine how high above grade a structure should be elevated to meet the required flood elevation from the ABFE or FIRM. The ground elevations can be determined by a licensed surveyor or topographic maps. If neither of those options is readily available, the National Oceanic and Atmospheric Administration (NOAA) has provided FEMA with provisional, high-resolution topographic data collected in 2004 used in the development of the Katrina Recovery Maps. Once both the required flood elevation and ground elevations are obtained, the site's ground elevation (topographic elevation) is subtracted from the site's required flood elevation to calculate the approximate foundation elevation above grade.
 - If the required elevation height is less than or equal to 15 feet, select an open foundation that is designed to resist all flood forces and erosion and scour effects. Design professionals may refer to FEMA Publication 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundations* (publication pending) for additional details.
 - If the required elevation height is greater than 15 feet, a design professional must be consulted to determine if an open foundation is feasible given the building site conditions.

- **Estimating costs:** Open foundation costs need to be estimated on the required elevation height. FEMA has estimated open foundation costs on a regional basis for the following elevation ranges:
 1. Up to 5 feet
 2. Over 5 feet to 10 feet
 3. Over 10 feet to 15 feet
 4. Over 15 feet

These open foundation costs will be available from the FEMA Regional Offices as a separate document that will be updated on a periodic basis. For more information about project cost estimating, see Section 2.5.

- Regardless of the elevation height requirement, the following site factors should be considered to determine which properties are feasible to reconstruct on open foundations. The evaluation of the following factors may require consultation with an experienced design professional knowledgeable of local conditions:
 1. Bearing capacity – In areas known to have soils with low bearing capacity, options for open foundation construction may be limited.
 2. Erosion and scour – In areas historically subject to erosion and scour (i.e., sites along the coast or adjacent to waterways), options for open foundation construction may be limited.
 3. Site access - In areas with poor site access or limited clearances between adjacent buildings, open foundation construction may not be feasible.
- If open foundation design is technically feasible based on the site factors listed above, select an open foundation. *Proceed to Step 3.*
- If open foundation design is not technically feasible based on the site factors listed above, then mitigation reconstruction is not feasible. *Reconsider acquisition or other mitigation options.*

Closed Foundation Allowed

- **Estimating height:** If a closed foundation is required or recommended based on Step 1, determine the required elevation height of the foundation. This can be done by acquiring the ABFE from the Katrina flood recovery data on the FEMA website (http://www.fema.gov/rebuild/mat/mat_katrina.shtm) or the BFE from the FIRM if an ABFE has not been determined for site. Since the ABFEs and FIRM BFEs are measured relative to NAVD88 (or roughly sea level), the ground surface elevations are needed to determine how high above grade a structure should be elevated to meet the required flood elevation from the ABFE or FIRM. The ground elevations can be determined by a licensed surveyor or topographic maps. If neither of those options is readily available, the National Oceanic and Atmospheric Administration (NOAA) has provided FEMA with provisional, high-resolution topographic data collected in 2004 used in the development of the Katrina Recovery Maps. Once both the required flood elevation and ground elevations are obtained, the site's ground elevation (topographic elevation) is subtracted

from the site's required flood elevation to calculate the approximate foundation elevation above grade.

- If the required elevation height is less than or equal to 8 feet, select a closed foundation. Design professionals may refer to FEMA Publication 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundations* (publication pending) for additional details.
- If the required elevation height is greater than 8 feet, select an open foundation using the "Open Foundation Required or Recommended" procedures defined above.
- **Estimating costs:** Closed foundation costs need to be estimated on the required elevation height. FEMA has estimated open foundation costs on a regional basis for the following elevation ranges:
 1. Up to 5 feet
 2. Over 5 feet to 10 feet
 3. Over 10 feet to 15 feet
 4. Over 15 feet

These closed foundation costs will be available from the FEMA Regional Offices as a separate document that will be updated on a periodic basis. For more information about project cost estimating see Section 2.5.

- Regardless of the elevation height requirement, the following site factors should be considered to determine which properties are feasible to reconstruct on closed foundations: The evaluation of the following factors may require consultation with an experienced design professional knowledgeable of local conditions:
 1. Bearing capacity – In areas known to have soils with low bearing capacity, closed foundation construction may not be feasible.
 2. Erosion and scour – In areas historically subject to erosion and scour (i.e., sites along the coast or adjacent to waterways), options for closed foundation construction may not be feasible.
 3. Site access - In areas with poor site access or limited clearances between adjacent buildings, closed foundation construction may be limited.
- If closed foundation design is technically feasible based on the site factors listed above, select a closed foundation. *Proceed to Step 3.*
- If closed foundation design is not technically feasible based on the site factors listed above, select an open foundation using the "Open Foundation Required or Recommended" procedures defined above.

Select and group specific structure types based on foundation and other site factors

The next step is to select and group the specific structure type or types based on the foundation type selected in Step 2 (open or closed), foundation height, and other site factors. Grouping structures in this way will aid in the development of the cost estimate, as described in the next section. The potential structure types allowed for this mitigation reconstruction pilot include wood frame, masonry, modular, and manufactured. The other site factors that will need to be examined are listed in the bullets below:

- Foundation height
- Square footage
- Site access
- Design wind speed and other wind design factors
- Foundation bearing capacity
- Shape
- Distance from coast
- Cost

HMGP RECONSTRUCTION GRANT PILOT FOR HURRICANES KATRINA, RITA AND WILMA

PROJECT COST ESTIMATING

As stated in Section 2.5., each HMGP Reconstruction Grant Pilot project requires a cost estimate as part of the technical and cost effectiveness evaluation process. To aid the Applicant, reconstruction project costs have been estimated by FEMA and will be updated and maintained throughout the recovery process. The estimated costs are based on the foundation type, required elevation height and geographic area. The FEMA costs will be provided on a dollars per square foot basis and include the following costs listed in Table 2-1 as included in the \$150,000 Federal share funding limit:

- Pre-construction
- Site preparation
- Foundation
- Structural shell
- Interior finishes
- Construction completion

As noted in Section 2.5, these costs are based on materials, service equipment and construction practices of "standard grade," with basic exterior ornamentation and interior refinements consistent with an average quality of construction as defined by Marshall & Swift, R.S. Means, or similar guidance. Note that FEMA costs are provided to facilitate the development of the overall project costs by the Applicant as well as the Grantee's evaluation of submitted cost estimates. All foundations of the same type and height range within an application will have costs allocated on the same square foot basis. Applicants will identify the type and number of structures of each possible combination to be included in the proposed project.

Applicants may contact their Grantee to obtain the FEMA-provided cost estimate and may use these values without submitting additional documentation. However, if the estimated overall project costs are higher than the current FEMA costs, then the Applicant has the option to submit their own documented costs using the "Mitigation Reconstruction Grant – Structure by Foundation Type Unit Cost Estimate" form provided on the following page. For Applicants that do not use the square foot costs provided by FEMA, documentation of all line items in the cost estimate(s) must be provided. Documentation of these costs must be credible, detailed (i.e. not lump sum) and include the unit measure, unit cost and source of the estimate for each construction phase. If the cost estimate is prepared independently, the costs shall be based on the construction of fundamental, code-compliant structures with essential appurtenances as described above. The general project activities, as listed in the form below, should be provided in a dollars-per-square-foot (\$/SF) format. This will allow for a comparative review of projects of varying types within a region and ensure that reasonable construction costs have been submitted.

Cost information will be maintained and updated by FEMA to keep the reference cost range information as current as possible. Additional dollars per square foot (\$/SF) information provided by Applicants will be used by FEMA to manage the changing dynamic of construction cost variances through the Gulf Coast and through the life cycle of the HMGP Reconstruction Grant Pilot.